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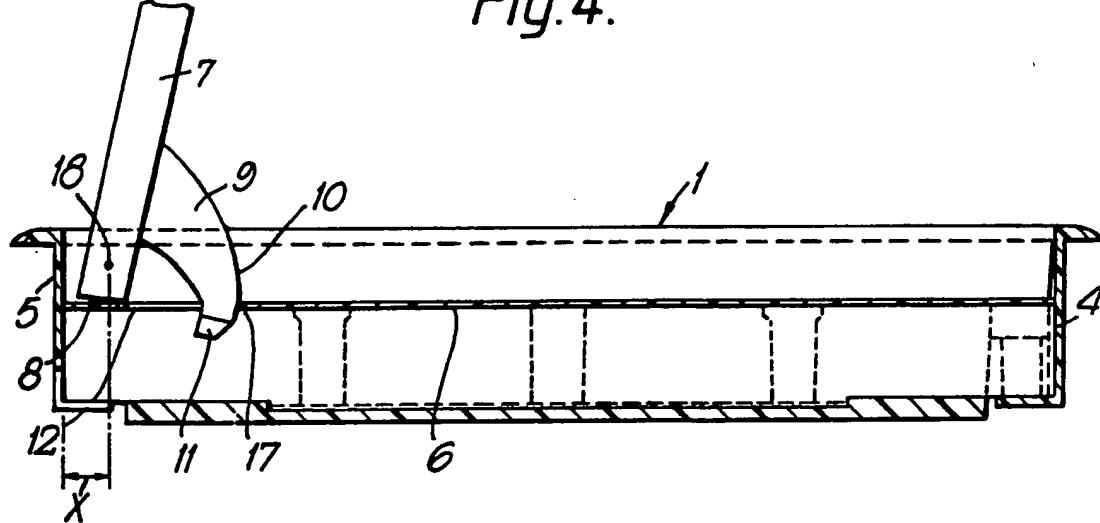
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(54) A combination of a fixed frame and a movable shutter pivotally mounted therein

(57) A lid or shutter 7 is hinged to a fixed frame 1, e.g. in an outlet box for underfloor electrical facilities, by hinge arrangements each including a longitudinally extending slot 12 in the frame 1 and a shaped cam member 9 integral with the lid 7 and engaging in the slot in the frame. A curved cam face 10 of each cam member 9 engages one end 17 of the associated slot 12 such that the pivotal axis 18 of the lid 7 is permitted to move between a first position at a minimum spacing from the rear wall 5 of the frame 1 when the lid is closed and a second position at a maximum spacing from the rear wall when the lid is open. Such movement of the pivotal axis reduces the risk that the lid 7 will foul the frame as the lid moves from the closed to the open position.

Fig.4.



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Fig. 1.

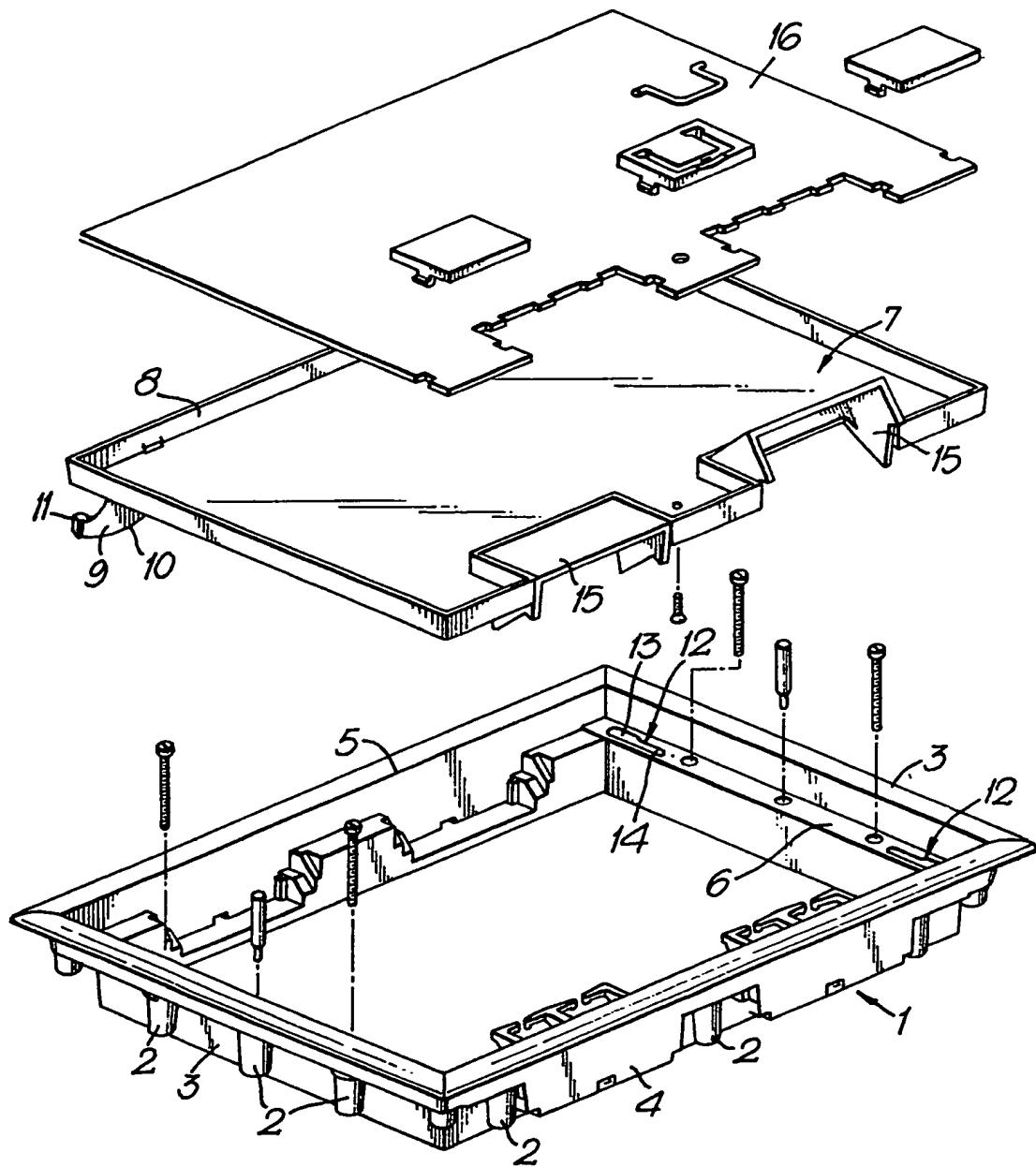
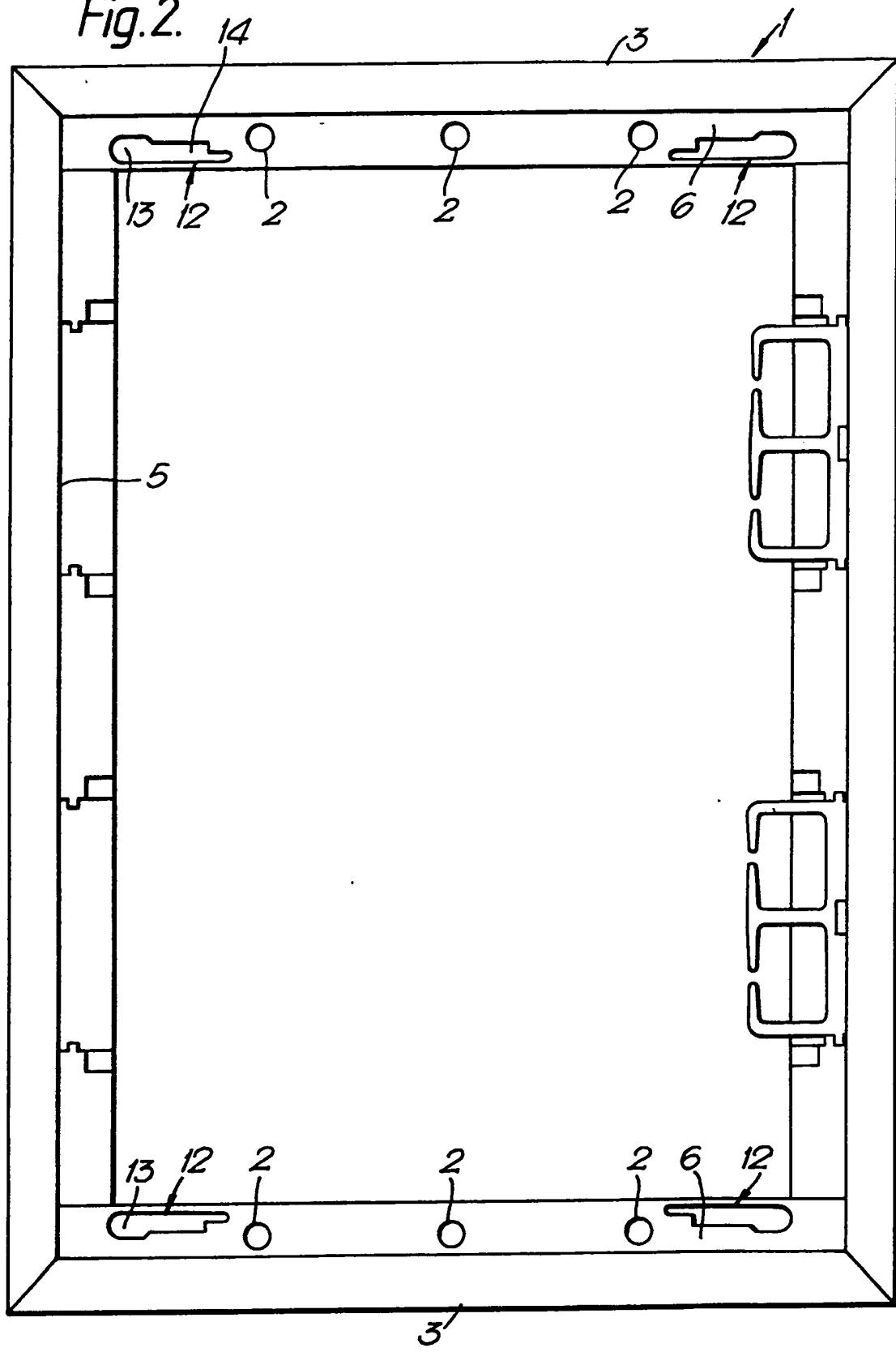


Fig.2.



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Fig. 3.

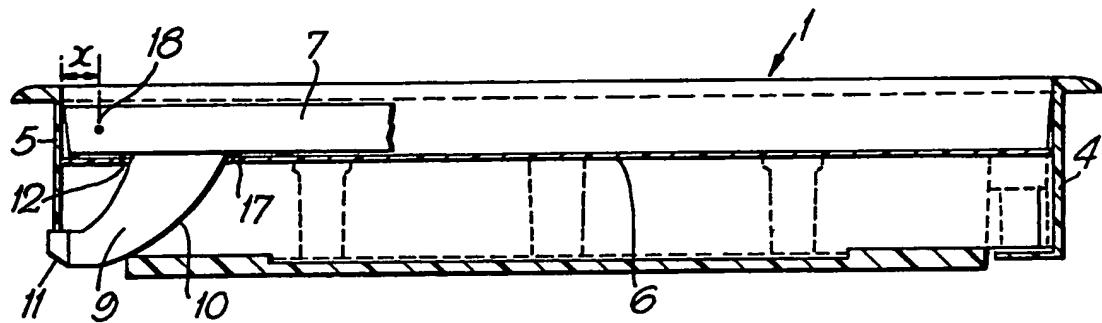
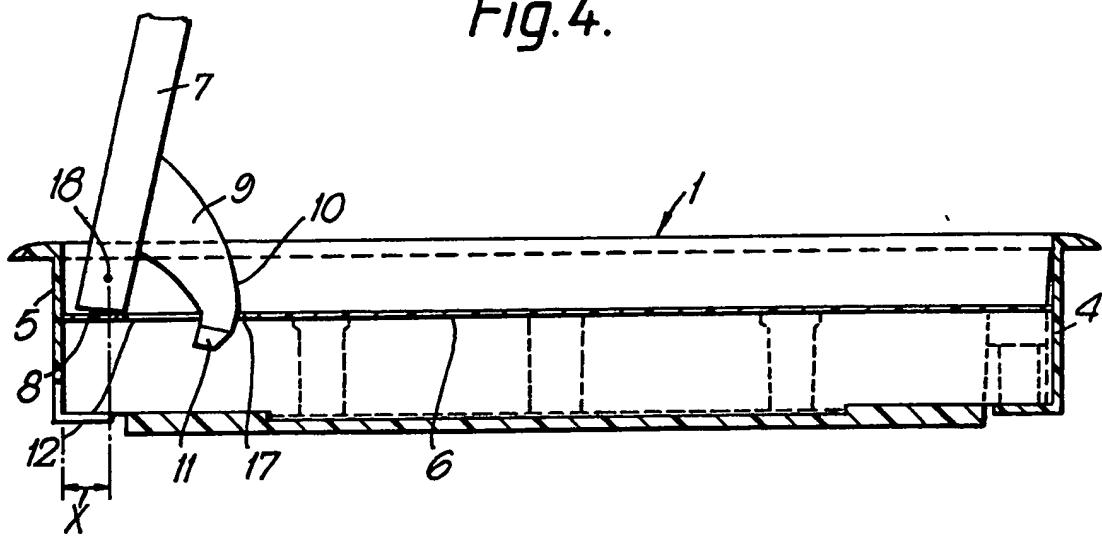


Fig. 4.



A COMBINATION OF A FIXED FRAME  
AND A MOVABLE SHUTTER PIVOTALLY MOUNTED THEREIN

This invention relates to a combination of a fixed frame and a movable shutter pivotally mounted in the frame. For convenience, the term "shutter" is intended to include closure members such as lids, doors, covers, 5 etc, and the term "frame" is intended to include not only door frames but also enclosures such as containers, boxes, etc. The invention is especially, but not exclusively, concerned with an electrical distribution box having a movable lid pivotally mounted in the box.

10 Such distribution boxes, also known as access or outlet boxes, provide access points for otherwise hidden electrical power and communications facilities. One common use of electrical distribution boxes is in underfloor cable trunking systems.

15 In a combination of a fixed frame and a movable shutter pivotally mounted in the frame, there is a substantial risk that, when the pivotable shutter pivots about an axis extending at or near one of the edges of the shutter, the pivotable shutter will foul the 20 neighbouring part of the fixed frame. As the shutter pivots, an edge of the shutter is prone to engage and bind with the neighbouring part of the frame, especially where the shutter is required to be a close fit in the frame. This problem has been tackled by complex linkage 25 arrangements such that the shutter can be lifted clear of its surrounding frame before being pivoted. However,

such arrangements have resulted in shutters which are movable in several directions when open, leading to difficulty in operation and frequent jamming.

It is an object of the present invention to 5 provide, in an improved combination of a fixed frame and a movable shutter pivotably mounted in the frame, an improved hinge arrangement which overcomes such disadvantages.

According to the invention, the improved 10 combination comprises a fixed frame and a movable shutter pivotally mounted in and with respect to the frame, between open and closed positions, about a pivotal axis extending alongside one rectilinear edge of the shutter by means of at least one hinge arrangement, 15 said one rectilinear edge of the shutter being substantially contiguous with a neighbouring rectilinear part of the frame when the shutter is in its closed position, wherein the or each hinge arrangement comprises a longitudinally extending slot in a portion 20 of the frame and, in engagement in the slot, a cam member integral with or secured to the shutter, which cam member is of such a shape and size that a face of the cam member engages one end of the slot and that, as the shutter is caused to pivot from its closed to its 25 open position, the pivotal axis of the shutter is permitted to move from a first position at which it is a predetermined minimum spacing from the neighbouring

rectilinear part of the frame to a second position at which it is at a predetermined maximum spacing from said neighbouring rectilinear part of the frame.

By virtue of the improved hinge arrangement

- 5 employed in the improved combination, the pivotal axis of the shutter is constrained to move away from said neighbouring rectilinear part of the frame as the shutter is opened, thereby substantially reducing the risk that said rectilinear edge of the shutter will foul  
10 said neighbouring rectilinear part of the frame.

Preferably, the cam member of the or each hinge arrangement is so shaped as to provide a smooth transition between the predetermined minimum and the predetermined maximum spacing of said rectilinear edge  
15 of the shutter from said neighbouring rectilinear part of the frame as the shutter is pivoted from its closed to its open position.

The longitudinally extending slot of the or each hinge arrangement preferably lies substantially normal  
20 to the pivotal axis of the shutter. Conveniently, the face of the cam member of the or each hinge arrangement engages that end of the associated longitudinally extending slot remote from the pivotal axis of the shutter. Conveniently, also, the portion of the frame  
25 in which the slot of the or each hinge arrangement is present comprises a ledge against which the shutter is constrained to lie when in its closed position.

The cam member of the or each hinge arrangement may be provided with an enlarged spigot at its distal end, so as to restrict its removal from the associated longitudinally extending slot. In a preferred 5 arrangement, the longitudinally extending slot and the spigot of the associated cam member of the or each hinge arrangement are so dimensioned that the cam member will be constrained within the slot on the application of a force up to a predetermined threshold force, and can be 10 forceably released from the slot on the application of a force in excess of the predetermined threshold force. This provides for separation of the shutter from the frame in situations where over-stressing of the or each hinge arrangement is taking place. Additionally or 15 alternatively, the longitudinally extending slot of the or each hinge arrangement may be provided with a widened section, of a width greater than that of the enlarged spigot of the associated cam member, so as to allow removal of the cam member from the slot, the widened 20 section being located other than where the spigot meets the slot in the normal opening and closing of the shutter. This arrangement allows authorised manual disassembly of the shutter from the frame.

Conveniently, the shutter and the cam member or 25 members are formed as a one-piece plastics moulding.

The invention further resides in an improved electrical distribution box for electrical power and communication systems, which distribution box comprises a fixed frame and a movable lid pivotally mounted in and 5 with respect to the frame, between open and closed positions, about a pivotal axis extending alongside one rectilinear edge of the frame by means of at least one hinge arrangement, said one rectilinear edge of the lid being substantially contiguous with a neighbouring 10 rectilinear part of the frame when the lid is in its closed position, wherein the or each hinge arrangement comprises a longitudinally extending slot in a portion of the frame and, in engagement in the slot, a cam member integral with or secured to the lid, which cam 15 member is of such a shape and size that a face of the cam member engages one end of the longitudinal slot and that, as the lid is caused to pivot from its closed to its open position, the pivotal axis of the lid is permitted to move from a first position at which it is a 20 predetermined minimum spacing from the neighbouring rectilinear part of the frame to a second position at which it is at a predetermined maximum spacing from said neighbouring rectilinear part of the frame.

The or each hinge arrangement of the improved 25 electrical distribution box may include any one or more of the optical features of the or a hinge arrangement of

the improved combination of a fixed frame and a movable shutter as hereinbefore described.

The invention is further illustrated by a description, by way of example, of a preferred 5 electrical distribution box suitable for use in an underfloor cable trunking system with reference to the accompanying drawings, in which:

Figure 1 is an exploded isometric view of the distribution box;

10 Figure 2 is a plan view of the frame of the distribution box shown in Figure 1;

Figure 3 is a side view, partly in section and partly in elevation, of the frame of the distribution box shown in Figure 1 with the shutter of the box in its 15 closed position; and

Figure 4 is a similar view of the frame of the distribution box shown in Figure 1 with the shutter of the box in its open position.

Referring to Figures 1 and 2, the distribution box 20 comprises a frame in the form of a plastics trim 1 of generally rectangular shape. The trim 1 is a one-piece plastics moulding and includes fixing locations 2 by which the frame can be secured to the remainder of an underfloor distribution box (not shown). The plastics 25 trim 1 is constituted by two side walls 3, conjoining a front wall 4 and a rear wall 5. A ledge 6 extends along the inside of each of the side walls 3 of the trim 1.

A shutter in the form of a lid 7, separately formed with respect to the trim 1, is dimensioned so as to be received within the trim and seated on the ledges 6. The lid 7 is also a one-piece plastics moulding and is 5 provided with two hinge arrangements, one towards each end of the rear edge 8 of the lid. Each hinge arrangement comprises a cam member 9 integrally formed with the lid 7 and including a curved cam face 10 and, at its free end, an enlarged spigot 11. The cam members 10 9 are received in slots 12 in the side ledges 6 close to the rear wall 5 of the trim 1, each slot comprising a wide section 13, nearer the rear wall and broader than the width of each spigot 11, and a narrow section 14, remote from the rear wall and narrower than the width of 15 each spigot.

Preferably, as shown in Figures 1 and 2, two slots, similar in shape and configuration to the slots 12, are provided in the side ledges 6 of the trim 1 close to the front wall 4 of the trim so that the lid 7 can be 20 received within the trim with the hinge arrangements adjacent either the rear wall 5 or the front wall. The lid 7 also includes cable outlet flaps 15 and is covered with a finishing trim 16 separately formed with respect to the lid or with a carpet tile (not shown).

25 The operation of the hinge arrangements will now be described with reference to Figures 3 and 4. When the lid 7 is in its closed position as shown in Figure 3,

each cam member 9 is received in its associated slot 12, longitudinal movement of the lid with respect to the trim 1 being constrained by engagement between each cam face 10 and one end face 17 of the associated slot 12.

5 remote from the rear wall 5 of the trim. The pivotal axis of the lid 7, shown generally at 18, is spaced from the rear wall 5 of the trim 1 by a distance "x".

When the lid 7 has been pivoted to its open position as shown in Figure 4, longitudinal movement of 10 the lid with respect to the trim 1 is still constrained by engagement of each cam face 10 against the end face 17 of the associated slot 12, but the shape of each cam face is such that the pivotal axis 18 of the lid is spaced from the rear wall 5 of the trim by a distance 15 "X", which distance is greater than the distance "x" shown in Figure 3. In pivoting the lid 7 from the closed position shown in Figure 3 to the open position shown in Figure 4, the shape of each cam face 10 is such that the pivotal axis 18 of the lid gradually moves 20 further away from the rear wall 5 of the trim 1, so that risk of the rear edge 8 of the lid jamming against the rear wall 5 is substantially eliminated.

As shown in Figure 4, when the lid 7 is in its fully open position, the enlarged spigot 11 of each cam 25 9 engages that part of the undersurface of the side ledge 6 bounding the narrow section 14 of the slot 12 and preventing passage of the spigot through the slot.

However, if the lid 7 is forced beyond its fully open position, for example by a person or object pushing against the lid, the spigot 11 of each cam 9 will be forced through the narrow section 14 of the slot 12, the 5 parts of the plastics trim 1 bounding the slot being resiliently deformed, thereby allowing the lid to become detached from the trim. By manoeuvring the cam members 9 such that the spigots 11 pass through the wide sections 13 of the slots 12, the lid 7 can be readily 10 manually removed and replaced, without the need for the spigots 11 to be forced out of the slots.

As shown in Figure 4, in order that the lid 7 will be self-closing, the hinge arrangements are so designed that, in the fully open position of the lid, the lid is 15 at an angle of less than 90° to the upper surface of the trim 1.

CLAIMS

1. A combination of a fixed frame and a movable shutter pivotally mounted in and with respect to the frame, between open and closed positions, about a pivotal axis extending alongside one rectilinear edge of the shutter by means of at least one hinge arrangement, said one rectilinear edge of the shutter being substantially contiguous with a neighbouring rectilinear part of the frame when the shutter is in its closed position, wherein the or each hinge arrangement comprises a longitudinally extending slot in a portion of the frame and, in engagement in the slot, a cam member integral with or secured to the shutter, which cam member is of such a shape and size that a face of the cam member engages one end of the slot and that, as the shutter is caused to pivot from its closed to its open position, the pivotal axis of the shutter is permitted to move from a first position at which it is a predetermined minimum spacing from the neighbouring rectilinear part of the frame to a second position at which it is at a predetermined maximum spacing from said neighbouring rectilinear part of the frame.
2. A combination as claimed in Claim 1, wherein the cam member of the or each hinge arrangement is so shaped as to produce a smooth transition between the predetermined minimum and the predetermined maximum spacing of said rectilinear edge of the shutter from

said neighbouring rectilinear part of the frame as the shutter is pivoted from its closed to its open position.

3. A combination as claimed in Claim 1 or 2, wherein the longitudinally extending slot of the or each hinge arrangement lies substantially normal to the pivotal axis of the shutter.

4. A combination as claimed in Claim 3, wherein the face of the cam member of the or each hinge arrangement engages that end of the associated longitudinally extending slot remote from the pivotal axis of the shutter.

5. A combination as claimed in any one of the preceding Claims, wherein the portion of the frame in which the slot of the or each hinge arrangement is present comprises a ledge against which the shutter is constrained to lie when in its closed position.

6. A combination as claimed in any one of the preceding Claims, wherein the cam member of the or each hinge arrangement is provided with an enlarged spigot at its distal end, so as to restrict its removal from the associated longitudinally extending slot.

7. A combination as claimed in Claim 6, wherein the longitudinally extending slot and the spigot of the associated cam member of the or each hinge arrangement are so dimensioned that the cam member will be constrained within the slot on the application of a

force to a predetermined threshold force, and will be forceably released from the slot on the application of a force in excess of the predetermined threshold force.

8. A combination as claimed in Claim 6 or 7, wherein the longitudinally extending slot of the or each hinge arrangement is provided with a widened section, of a width greater than that of the enlarged spigot of the associated cam member, so as to allow removal of the cam member from the slot, the widened section being located other than where the spigot meets the slot in the normal opening and closing of the shutter.

9. A combination as claimed in any one of the preceding Claims, wherein the shutter and the cam member or members are formed as a one-piece plastics moulding.

10. An electrical distribution box for electrical power and communications systems comprising a fixed frame and a movable lid pivotally mounted in and with respect to the frame, between open and closed positions, about a pivotal axis extending alongside one rectilinear edge of the frame by means of at least one hinge arrangement, said one rectilinear edge of the lid being substantially contiguous with a neighbouring rectilinear part of the frame when the lid is in its closed position, wherein the or each hinge arrangement comprises a longitudinally extending slot in a portion of the frame and, in engagement in the slot, a cam member integral with or secured to the lid, which cam member is of such a shape